THE IDENTIFICATION OF COAL SEAMS.

BY ANDREW ROY.

The attempt to identify coal seams in sections hundreds of miles apart as equivalent strata, looks well on paper, but whether the Almighty made them to correspond so exactly in the ground, is more than doubtful. Were the seams continuous sheets, stretching from county to county with a uniform dip, an engineer could locate them with mathematical exactitude; or were the limestones

with which they are associated continuous strata, the geologist and paleontologist could work with ease and certainty. Unfortunately for the faults of nature, the geologists who have been at work in the Ohio coal-fields have been tyranized over by theories which the mining developments, meagre though they yet be, have proven to be false. Hence it is, that so many conflicting and contradictory reports have been made of the geology of the coal seams of Ohio.

Instead of coal seams being continuous sheets, they seem to have been formed in swamps or basins, similar in shape and structure to those in which the lower coal of the state series reposes—the basins having been scooped out of a comparatively level plain by erosive agencies before the vegetation from which the coal is derived was formed. Some of these basins are of quite limited area and contain only a few acres of coal. The basins of the lower coal measures are very numerous; were all the distinct beds enumerated, all the letters of the alphabet would scarcely suffice to give their names. The writer of this article has cut with the driller's chisel, in boring for the Briar Hill coal, though in but one instance, four distinct seams of coal, in less than eighty feet above the horizon of the lower seam, each seam being at least six inches thick. The rider which overlies the Briar Hill coal, called No. 2, by Dr. Newberry; the Quakerton coal, by Prof. Orton, comes in eighteen to twenty-four feet above the lower coal, in Trumbull county. At forty feet anot er seam is occasonally met, and at seventy or eighty feet yet another; all of which are called the Quakerton coal, though they are each distinct seams, as much so as the great vein coal of the Hocking Valley and the lower coal of the Mahoning Valley are seperate strata.

In the Great Central or Illinois basin, which covers 36,000 square miles of the State of Illinois alone, the local basins in which the seams repose are much smaller than in the Ohio coal field. In Iowa and Missouri the swamps are also very limited in area. The writer, who has twice visited the Missouri coal field, in Bates county, within two or three years, has had an opportunity of studying the structure of the coal basins of that county in two exhausted mines, and found that the coal rose on hills in the mine and thinned down gradually until it disappeared altogether, or was suddenly cut away by a fault—evidently the lashings of the ancient shore waves in the early subsidence of the land. In the mines of Brazil, Indiana, the same conditions are met. There two distinct seams of mineable thickness within forty feet of each other, each lying in local basins or swamps. Although both seams may be due the mining adventurer dare not sink for either until he has first explored the ground with the driller's chisel.

The seams of the Pennsylvania field are no doubt of a similar structure, though the basins are much larger as a general rule in the Appalachian belt than in any of the other great carboniferous basins of the United States.

The attention of geologists does not seem to have been seriously directed to this subject to date, as regards the shape and size of the several basins; however, neither science nor mining experi-

ence will be able to throw much light upon them. Every practical miner knows that the lower coal at Youngstown, at Massillon and in Jackson county lies in swamps or basins of limited area, but the most intelligent among them would hesitate to warrant the existence of this coal where it is due until the territory has first been drilled over a practical test is invariably adopted in the above districts by practical men.

Some of the lower coals of the Ohio field occupy much greater basins than others; again, some of the basins in which a seam reposes are much smaller at one point than another. We learn these facts only after the miner has cut away the coal. Science will in time tell us how these basins were formed, and a discussion of the subject may again revive the theory of the origin of coal by accumulation of vegetable detritus drifted by rivers and bays into estuaries. This theory has in fact been revived by two eminent French geologists, M. M. Grand Eury and Fayol, within the past year or two.

The theory that the old coal plain was a low, level swamp, skirting the ocean, upon which the coal vegetation grew, which Orton and other geologists are so fond of asserting, is assuredly a mistaken one, as the geologists will discover as soon as they begin the study of the coal floor of mines, and the theory that the plants from which the coal is formed were transported from their places of growth and deposited in the bottom of water basins, which M. M. Grand Eury and Fayol affirm, is a better explanation of the formation of coal. This theory, we believe, Major Powell, the director of the United States geological survey, also holds on the subject. Such, at least, was our impression after a discussion of an hour's duration with him in his office in Washington, a few months ago.

The undulating and unconformable character of coal seams, make it a work of the greatest difficulty to identify them within even a mile or two, as a few cases in point will show. At Salineville, Columbiana county, two seperate seams are mined, known as the big vein and the strip vein. The Empire Mine was reported upon by Col. Charles Whittlesey, the veteran Ohio geologist, in 1874, and he recognized the Empire coal as the strip vein, the Empire mine being within half a mile of the big vein mines; yet subsequent developments proved that the Empire mine was not the strip vein but the big vein, which lies sixty feet lower than the strip vein. Dr. Newberry also, in his report of 1857, of the Mineral Ridge and Briar Hill coals, called them separate veins, divided by forty feet of strata—the mines being two miles apart. Yet a few years afterward these mines ran through on each other, showing them to occupy the same horizon. These mistakes were quite pardonable in the geologists, who reported upon the coals in question; they show how difficult a matter it is to identify coal seams. The geologist who asserts that he can trace the series of Ohio coal across the whole extent of the mineral field and locate each seam with ease and certainty, is a dreamer of dreams. He knows not whereof he affirms. Commencing work on

a mistaken theory, he is no wiser than those who have gone over the same ground, no two of whom reported the same facts. It will be time enough half a century hence for a geologist to affirm that he can identify the coal seams of Mahoning county with those of Lawrence county.

Were the swamps in which various seams rest met, one along side of another on the same horizon, and it was known positively that there were but fourteen distinct coal horizons in the lower coal measures, it would still be a difficult task for any geologist to locate with ease and certainty; for by reason of the unconformable character of the strata underlying each seam and the nature of the seam itself, the horizon of one coal on the hill sides of the mine frequently rises te the horizon of the seam immediately overlying it in the swamp or basin. Thus we may have two coals, one of which is geologically forty to fifty feet below the other, occupying the same, or even a higher level. In the case of the lower coal, it is no unusual thing for that bed to rise twenty to thirty feet above the horizon of coal No. 2. He who runs over the coal field cannot read it correctly. The mining engineer and practical mince accustomed to daily tackle such problems are often nonplussed and time and money is required to solve them.

In view of the many perplexing questions in the coal geology of Ohio, the late geological survey is a marvel of work well done, particularly when it is remembered that, with the exception of the few mining districts opened in coal No. 1, there were no developments to assist the geologists in the prosecution of their work.

We wish we could say as much for the geologists themselves; they were all too intolerant of each others reports. It would have been soon enough after all the members of the corps had been gathered to their their fathers to have re-opened a discussion of thr order of the coal strata of the State.